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Psychological Bulletin

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THE

PSYCHOLOGICAL BULLETIN

AN EXPERIMENT WITH AN AUTOMATIC MNEMONIC SYSTEM

BY DAVID SPENCE HILL

The University of Illinois

Classroom Experimentation.—It is perhaps rare that an instructor can find time and means available to utilize a good mnemonic system for purposes of classroom demonstration, and not only to prove by experiment the defects and limitations of the method but also to demonstrate the operation in consciousness of the "laws of association."

Too often students studying psychology for the first time are prone to accept the various formulae for the laws of association as mere rules or statements to be learned, rather than as basal processes of consciousness to be demonstrated by introspection under controlled conditions.

We have found, in the course of instruction of several different classes in elementary and in educational psychology, that the use of the mnemonic device which we are about to record here has been of pedagogical value as a classroom experiment. The experiment consists essentially of this procedure: Students who have been studying the general fact of association, *i. e.*, that "perceptions and ideas once welded together in consciousness tend to persist," are told (*a*) of the illicit uses of mnemonic systems by memory-trainers and charlatans, and (*b*) that the principle of association indicated above can be strikingly demonstrated by a certain mnemonic device. They are also told (*c*) that on the next day or recitation the instructor will undertake two things: (1) He will repeat in any consecutive order required, backward or forward, or in irregular order, a list of disconnected words prepared by the students and read slowly to him *once*. (2) He will afterwards teach the students how to do the same thing, following a few minutes' instruction. The writer has found that curiosity, interest, and considerable

reading result from the announcement, and when he does the two things promised.

We print below the system, which is based upon an adaptation of the old letter-number principle, devised by us and now printed for the first time. If the reader is sufficiently interested to read the following paragraphs attentively he will probably find that the system itself can be "memorized" almost without effort, that is, a single careful consideration of the spelling and of the visual imagery of each word of the hundred will result in his being able to name most of them in any order. This is a point of value, since many mnemonic systems are so hard to retain that they are practically useless. In using the system in order to retain another prepared list (preferably simple, concrete nouns, as: ship, iron, money, etc.) the experimenter, if he has not already mastered the mnemonic device, may hold the same written on a card before his eyes while he listens to the very slow reading of the new list to be retained.

An Automatic Mnemonic System for Retention and Recall of Isolated Words

1. Air	11. Ambrosia	21. Boa	31. Cocoa	41. Dahlia
2. Bar	12. Arab	22. Bag ?	32. Cab	42. Daub
3. Car	13. Alcoholic	23. Boracic	33. Comic	43. Diabetic
4. Dagger	14. Almond	24. Bed	34. Card	44. Diamond
5. Ear	15. Ape	25. Bee	35. Cane	45. Dice
6. Fur	16. Aloof	26. Beef	36. Calf	46. Dwarf
7. Gar	17. Aching	27. Bog	37. Cog	47. Dog
8. Hunger	18. Arch	28. Bunch	38. Cough	48. Dish
9. Indicator	19. Alkali	29. Biloxi	39. Cacti	49. Delphi
10. Acorn	20. Bun	30. Can	40. Dun	50. Emulsion
51. Encyclopedia	61. Fibula	71. Guava	81. Henna	91. India
52. Ebb	62. Fob	72. Grab	82. Hub	92. Istib
53. Epic	63. Franc	73. Garlic	83. Heretic	93. Ipecac
54. Ephod	64. Ford	74. Ground	84. Hand	94. Island
55. Engine	65. Face	75. Gate	85. Home	95. Imbecile
56. Elf	66. Fig-leaf	76. Golf	86. Hoof	96. Icefish
57. Egg	67. Fog	77. Gong	87. Hog	97. Icing
58. Elijah	68. Fish	78. Growth	88. Hash	98. Itch
59. Ennui	69. Fungi	79. Gobi	89. Haiti	99. Impi
60. Fan	70. Gun	80. Hen	90. Iron	100. Ann

[Notes: Biloxi (29) = Gulf town in U. S.; Istib (92) = Turkish village; Impi (99) = African savage.]

How to Master Easily the Mnemonic System.—The two cardinal prerequisites for the use of the device are: (*a*) Understanding of

the principles underlying the choice and spelling of the words in the above list of mnemonics, and (*b*) insistence upon forming at the outset a vivid, clear image (if possible visual) of the thing represented by each word of the mnemonic series.

(*a*) *How the permanent list of mnemonics is formed.*—Notice the nine digits, respectively, 1, 2, 3, 4, 5, 6, 7, 8 and 9, correspond to the first nine letters of the alphabet, each of which letters in consecutive order marks the first letter in each of the first nine words. *I. e.*, a = 1 (air); b = 2 (bar); c = 3 (car); d = 4 (dagger). The last letter (r) of the first nine words has no significance, except to help identify these words—air, bar, car, etc.,—as belonging to the first nine.

Mnemonics 10, 20, 30, 40, 50, 60, 70, 80, 90 are thus formed: Let O (zero) = N. The first degit will be represented as before, a = 1, b = 2, c = 3, etc. Then we may always represent 10 by *acorn*, 20 by *bun*, 30 by *can*, 40 by *dun*, 50 by *emulsion*, 60 by *fan*, 70 by *gun*, 80 by *hen*, 90 by *iron*, 100 by *Ann*. Study each word of the series until the formation is understood, as related to the first and last letters of its spelling.

(*b*) *Imagery association with each word in the mnemonic list.*—To the writer, the word *air* brings up a picture of the open heavens, atmosphere, blue sky. *Bar* to him recalls a great sand bar he once saw on the seashore. *Car*, a passenger coach. *Dagger*, a silver paper cutter on the desk. *Ear*, his own right ear. *Fur*, his wife's hand muff. *Gar*, a large fish he pulled from the water, etc. Each original association is of some definite experience. Make no attempt to memorize by sheer repetition the words of the above list. It is unnecessary. In that the words of the series are recalled mechanically (according to digit and letter), the device is in a sense automatic.

(*c*) *List easily recalled.*—If you understand the formation of each word according to the principle of correspondence of letters and digits explained in (*a*), and have aroused definite, vivid imagery for each word according to (*b*), then any word in the list may be easily recalled. Thus, what is the 25th word? It must begin with *b* and end with *e;* it is Bee.

Using the Mnemonic System.—Have some one write out and number 25 or 30 unrelated words, which he is afterwards to read to you. Concrete nouns are most suitable for the demonstration, as indicated at the outset. Make the steadfast rules: (*a*) Each word needs be read aloud but one time, (*b*) do not permit a word to be

read until you say "now" or "next." That is, until you have had time in which to build a picture mentally with the correspondingly numbered mnemonic. Each word heard must arouse in the experimenter's mind a definite image and this is to be related to the permanent images already formed for the mnemonic series, *e. g.*: The reader first says *dog*. I think of my own dog, his color, size, appearance, and in order to link the ideas with mnemonic 1, I try to think vividly of this dog sniffing the air on a light cloudless day. (See (*b*) above). I thereupon dismiss the picture. I say "now" or "next," and the reader for his second word perhaps says *tree*. Mentally I portray a lone tree upon that sandbar (see (*b*)) representing mnemonic 2. The next word is *brick*. I think of a railroad car (see (*b*)) full of bricks, the car representing mnemonic 3. The more vivid the picture, even if it be ridiculous, the more promptly will each mental complex be recalled after the 25, 30, or more words have thus been heard and the ideas blended or associated. Few persons will thereupon have difficulty in recalling in any required order the whole list heard but once. To recall, *e. g.*, the third word, one knows that the third mnemonic begins with *c* and ends with *r;* it is car. The image of *car* brings almost inevitably the persisting image of *brick*, ideas of which have been "welded in consciousness" with ideas of *car*, and so for each of the other words. It is hardly a process of memorizing, but the results are quite startling to one who does not know that the experimenter has the mnemonic list either in his head, or upon a card conveniently before his eyes if he does not care to learn the list by processes (*a*) and (*b*) above indicated.

For classroom purposes, the instructor should act as subject upon the first day, immediately afterwards displaying upon blackboard or chart the entire mnemonic system, with appropriate explanations. At the next meeting the students act as subjects, the instructor calling a list of words.

Finally, the potency of association and of vividness of impression as factors in retention and recall may be dwelt upon profitably. Since all new associations have been built upon old associations thoroughly familiar, namely, the digits and the alphabet, therefore the principle of apperception may also be illustrated. Appropriate cautions, warnings against formal mnemonics and memory trainers, and selected references for reading may be given.

Class Values.—When the nature of the course, the preparation of the students, and time, have permitted the use of our mnemonic

system we have found the following potential values in its adoption as a class experiment: (1) It demonstrates and then exposes a method by which some traveling lecturers on memory startle their audiences by seemingly difficult feats of memorization. (2) Participation and success upon the part of practically every student is obtained in class work. A student may marvel at the performance of the instructor and then he is disillusioned by being enabled to do the thing himself. A right evaluation of the mnemonic principle is made possible. (3) The process gives a cue and an impetus for the study and analysis of associative processes, laws of association, etc., by methods of introspection. (4) It is productive of interest in the possibility of modifying learning processes by means of economical methods, rather than by trial and error. It may be made a stimulus to experimentation of a serious character.

GENERAL REVIEWS AND SUMMARIES

AFFECTIVE PHENOMENA–DESCRIPTIVE AND THEORETICAL

BY H. N. GARDINER

Smith College

Wohlgemuth (7) is interested in discriminating the pain sensation from the affective qualities of feeling, and in finding for the latter, as distinct elementary processes, a neural correlate. For the distinction between pain and the feelings he adduces, along with other considerations, introspective evidence based on a research, to be published later in full, and defends the position taken against objections. As regards the neural correlate of feeling he finds that eminent psychologists inconsistently accept the principle that elementary processes of consciousness correspond to definite neurone processes and admit that the feelings are elementary, but refuse to accept the obvious conclusion. The citations do not bear him out. What is cited as supporting the major premise is not that, but for the most part the assumption of some form, often quite general, of the doctrine of psycho-physical parallelism, or correlation, and with this the nutrition, or dischargeability, theory which some of the writers hold is consistent, even if wrong. The view which the author finds probable is suggested by the investigations of Head and Holmes tending to fix the center of affection in the lateral zone of the optic thalamus. It is shown, indeed, that in the *syndrome thalamique* both pleasant and unpleasant feeling-tone may be exaggerated, even in some cases in the absence of sensation proper. But is this the only case where affectivity is modified? And even if we assume a functional disturbance in the thalamus in every such case, we hardly seem to come much nearer to a definite conception of the neural process in affection unless we know more precisely the influence exerted by the thalamus on other parts of the brain and on the brain as a whole.

Titchener (5) subjects to a thorough-going examination the affective psychology of Stumpf with reference to the author's recent *apologia*. Stumpf's doctrine rests on the distinction of emotions

and what are commonly termed sensory, or elementary, feelings, the former being, according to him, acts or functions, the latter, phenomena, namely, sensations. Titchener contends that the conception of emotion lacks clearness. Its psychological nucleus is represented as a *gemütliche Stellungnahme* based on an immanent judgment of matter-of-fact; but we have no definition of *gemütlich*. Further, in actual experience emotions are variously complicated by sensations, but although the difference between phenomenon and psychical function is said to be "the clearest-cut we know," Stumpf himself finds it difficult to decide, on occasion, whether a given experience is all function or partly phenomenon. In his doctrine of 'algedonic sensations' Stumpf groups together such heterogeneous things as cutaneous pain and the disagreeableness of asafoetida and introduces into psychology a unique and hitherto unknown class of sensations. This, though not conclusive, is at least a *prima facie* objection to his theory. Stumpf's replies to his critics are then reviewed and found wanting, and the historical background which he discovers in writers of the seventeenth and eighteenth century turns out to be a dissolving view when seen in the light of Titchener's erudition. Among the motives which led Stumpf to his theory Titchener notes particularly his interest in the feelings aroused by tones. Herein lies the real strength of the theory of algedonic sensations; it enables Stumpf to cope with the recorded changes of affective reaction to tone-sensations, "and especially with those due to habitual direction of attention, to dispositions of judgment, to habits of all kinds." But if it is to make converts, we must have the fourth volume of the *Tonpsychologie!* Incidentally Titchener makes an explanation of his own terminology which will interest many. Stumpf had charged him with vacillation. Titchener says that he is consistent. He parallels, he says, *affection*, the feeling element, with sensation; *feeling*, a complex of sensory and affective processes in which affection dominates, with perception; *emotion* with thought. But in so recent a work as "A Beginner's Psychology" we find a different usage; pleasant and unpleasant, the elementary processes, are designated *simple feelings* (p. 79), from which the blends of these with sensations are distinguished as *sense-feelings* (p. 81), under which term are included along with agreeable and disagreeable the other Wundtian "dimensions." The terminology *is* confusing.

Watson and Morgan (6), writing down all attempted descriptions and theories of emotions as felt experiences, show how they

may be treated as forms of behavior. They find only three fundamental emotional reactions in infants, reactions which, with some hesitation, they call fear, rage and love (=, approximately, Freud's sex), but which might equally well be called X, Y and Z, the important thing being that they are definitely describable in terms of response to situations which can also be described. It is suggested that all other emotional responses may possibly be derived from these three by what the Freudians call *Uebertragung*, for which the terms "attachment" and "detachment" are proposed, the essence of the conception being habit-formation. The authors claim to have presented evidence to show "(1) that by the method of conditioned reflexes emotional reactions can be called out by situations (stimuli) which do not at first call them out; and (2) that emotions, by virtue of the secretions that are present, furnish a 'drive' (possibility of reaction or continuance of the reaction) which is lacking in ordinary instinctive and habitual actions." These assumptions suggest experimentation. The writers tell us that they have already begun the following experiment: by means of a heliostat to flash a beam of light suddenly on the face of an infant lying face upward on a table in the dark; simultaneously with the flash a sound resembling thunder is made. The object is to see whether the flash of light will in time come to produce the cry called forth by the noise. From the remark made previously that thunder and lightning, occurring nearly simultaneously, afford the most suitable conditions for arousing a conditioned reflex, it seems to be suggested that the experiment might prove the origin of the fear of lightning; if so, the introspective psychologist and the student of folklore can only wonder at the naïveté of the assumption. The article indicates in conclusion certain ways in which, in the opinion of the writers, the results of such experiments might be utilized in business and education.

Mit Worten läasst sich trefflich streiten.—James, taking the common-sense view of emotion as a felt experience and regarding as "expression" the total somatic response to the stimulus, developed the theory, opposed to common-sense, that the former was aroused by the latter. Carr (1) seeks to mediate between this theory and the older view. He proceeds by a new set of definitions. Discarding the subjective point of view in psychology and with it James's "psychophysical dichotomy," he regards the emotion and its expression as functional activities of the organism "irrespective of the fact whether they do or do not contain a conscious compo-

nent." He distinguishes in the psychophysical process in question three part-processes, the act, the emotion, and incidental by-products of the emotion. The act includes such things as the fighting activities in anger, flight in fear; the incidental by-products are such things as the trembling in anger and certain digestive and nutritive disturbances due to the vasomotor shift. The emotion he defines as "all those prior and accompanying organic processes whose function it is to render the act more efficient." He bases this view on Cannon, as Watson and Morgan did theirs of the "drive." Emotion, then, is related to act as cause to effect. It is similarly related to expression, which means, as commonly understood, the manifestation of the emotion to an outside observer, apparently its superficial manifestation. It is plain that, if we mean these things by our terms, we get a different view from that of James, but do not meet his problem, and that, in certain respect, we are equally removed from common-sense.

Henry (**2**), writing on the training of the emotions, makes good use of the considered opinions of such reputable psychologists as Thorndike, Pillsbury, Colvin and Bagley, and concludes, with reference to the sublimation of the Freudians, "that an effective mode of emotional control lies in the formation of attitudes, ideals and sentiments, by attaching appropriate ideas to the original emotion as a core."

According to Rignano (**4**) every state of attention is formed by an affective contrast, due to the fact that a given primary affectivity awakened by a distance sense and tending to set up movements adapted to its satisfaction is opposed by a secondary activity excited by the primary in consequence of some disagreeable effect arising from the prompt and complete execution of these movements. To this affective contrast is due the double or multiple points of view under which the object of attention is observed, and the greater precision and justice in the "perception" of the object. An illustration is the behavior of Ll. Morgan's chicks with the orange-peel. The discussion implies a restricted use of the term "attention," as appears from the reference to Othello and the monomaniacs; these give no real attention (*véritable attention*), it is said, to the matters relating to their passions or ideas, and are accordingly predisposed to all sorts of autosuggestions and hallucinations. The theory takes no account of primary attention as awareness characterized by vividness and centrality. As regards consciousness, the thesis is maintained, with reference to well-known auto-

matisms, that it is not an intrinsic or absolute property of psychic states, but extrinsic and relative, one which accompanies certain modalities of reference, affective in nature, which these psychic states have among themselves. Some of the evidence adduced in support of this view seems capable of a different interpretation. Is it, for instance, so certain that, if we forget and are unable to recall something we are accustomed to do, such as putting away papers, winding the clock, putting out the gas, we must have done the act, as the author maintains, *unconsciously?*

The interesting study of courage from the French battle-front by Huot and Voivenel (3) has been made the subject of a special notice in a previous number of the BULLETIN.

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ATTENTION AND INTEREST

BY W. B. PILLSBURY

University of Michigan

Much of the work of the last year has dealt with the effects of distraction. The long work of Morgan (5) although published last year was not noticed then. Morgan's experiments consisted in a study of the incidental movements during distraction as well as of distraction itself. In essence his method was to have a subject carry on choice reactions of a complicated character with and without distractions and at the same time to record the pressure he exerted upon the key and his respiratory movements. The results were that distraction produced in thirteen of twenty-one subjects a diminution in capacity at first, followed in all but four by an in-

crease during the distraction, and eleven show a loss in efficiency after the distraction ceased. The incidental movements showed that the increased capacity was a result of greatly increased effort. During distraction the key was pressed with greater force, and in many cases the individual seemed to hold himself to his task by making slight movements of vocalization. In a second article Morgan (6) suggests that the reaction under a distraction might be used to detect individuals who are likely to break down under strain. Dallenbach (3) objects to certain statements made by Morgan of his work. Cassel and Dallenbach (2) test the effect of auditory distraction upon simple reaction time and find that the effect of distraction not only varies from subject to subject but also in the same individual from series to series. Intermittent distractions are more effective than continuous. Whether the distraction is to facilitate or to inhibit the reaction depends upon the attitude of the reagent. The passive attitude is conducive to a constant sensory reaction of normal length: the active attitude to a slow and variable reaction. Comparison of this report with Morgan's indicates that new work is necessary to determine all the laws of distraction. McQueen (4) reports an exhaustive study of the distribution of attention with particular reference to the question whether there are different types of individual, the concentrative and the distributive. His method was to determine the coefficients of correlation of distribution when different tasks are carried on together for forty children and upon a number of trained psychologists. Attention was divided between tapping and adding, sorting cards and counting by threes, putting discs on a needle by touch, comparing two circles and comparing four circles during a tachistoscopic exposure, and dotting circles with both hands on a band of paper moving behind a slit. The results indicate that there is no correlation between ability to distribute attention in one task and in another. The correlations were all low. After elimination for correlation between the tasks performed separately, the average correlation for distribution was .04. Study of displacement of ranks confirmed the conclusion. That the capacity to distribute is specific is evident, too, from the fact that there was slight correlation between capacity for making dots with right and left hands and that this varied when the band moved at different rates. In the tachistoscopic comparison of circles, observation showed the specific element to be the persistence of the image, primary memory. There was little correlation between success in distribution and teacher's

estimate of general intelligence. The correlation was greatest for tests that required considerable concentration and was negative for the motor tests. While there is no general factor of distribution the author insists that there is a unit factor of general intelligence. The author finds evidence in the introspections for the action of the four possible forms of distribution, (1) alternation, (2) one becoming automatic, and (3) psychical fusion (two acts were combined in a single rhythm), and (4) simultaneous attention to the two tasks as separate. The author does not give his absolute results but only the correlations. Titchener (8) gives a discussion of and answer to Britz's thesis in which the concept of clearness as an attribute is called into question. Titchener (8) shows that Britz is misled in his discussion of Wundt by not considering the historical development of Wundt's position. Britz's statement of Titchener's own position is inaccurate since it is based only upon the *Text-book* and a review of the *Feeling and Attention*. Titchener gives a clear restatement of the main points of his doctrine of clearness that will be valuable for ready reference. Valentine (10) makes a brief for the independence of volitional attention and for the possibility of training it. He argues first that Titchener is wrong in restricting volitional attention to action of alternative forces. In addition we must assume antecedent general tendencies. Frequent use of these tendencies may establish a habit and hence train attention. In bright children at least it is possible to develop a habit of attending to the inherently uninteresting as a means of attaining an interesting end and this may transfer. The argument is largely formal. Rignano (7) extends his theory of the dominance of affective elements to an explanation of attention. Attention occurs only when the object presented tends to arouse both pleasure and displeasure. Lloyd Morgan's chick attended only when pleasure from yolk and displeasure from caterpillar were struggling for mastery. The scientist is interested only in those facts that may either support or overthrow his theory. Consciousness as a whole is present only when present fuses with the past. It is not due to a state itself but to a relation. Here, too, affection must be present, but in this case the affective qualities agree. *Attention = contraste affectif; conscience = rapport affectif.* Thorndike (9) discovers a close correlation between the early interests of school children and their later interests and success in different subjects. The lowest correlation between early interests and later interests was 69, and the correlation between early interests and success in the upper three

grades of the elementary schools, in the high school and in college was .89 in each case.

Curtis and Foster (1) show by Meads' tachistoscopic method of determining clearness from the number of times an object first attracts attention that size was without influence upon attention. Where both size and intensity were varied intensity alone produced demonstrable effect.

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TIME AND RHYTHM

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Recent work on time and rhythm is fairly well distributed among the various fields of art and science concerned. Literature, music and zoölogy, in addition to psychology, are each represented.

The book by Patterson on the rhythm of prose (11) has attracted considerable attention in the literary journals. It is based on numerous psychological tests designed to determine individual differences with respect to the "sense of rhythm." Of all the tests, the most fundamental, as regards the theories to which the main body of the book is devoted, is the "phonograph test." For this test, five records were made by having a musically trained person

tap upon a small metal drum to the syllables or notes of three short passages of prose, one of music, and one of words arranged in haphazard order. These series of taps were then phonographically reproduced before a number of subjects,each of whom was asked to grade the series in various ways designed so as to determine his ability to organize the series of taps into a rhythmic series. It was found that some subjects succeeded much better than others. One declared that all five records gave him the impression of regular musical themes. Such an individual is termed a "timer," and is said to possess an "aggressive time-sense." He is one who has the ability to fit into an "elastic" subjective rhythm a series of syllables which in itself fails to coincide with this rhythm. Such a process of fitting-in is termed syncopation; and it is syncopation which is put forward as the experience that chiefly characterizes prose rhythm. In verse, the objective and subjective rhythms coincide; the rhythm is "coincident"; in prose, they do not; the rhythm is "syncopated."

Several short discussions of rhythm in its musical aspects appear in the *Musician* (3, 4, 12, 13). Seashore and Mount (16) publish the correlations between certain time-sense tests and the numerous other tests that have been employed at Iowa in the diagnosis of musical ability.

The biologists have indulged in a discussion of the synchronous flashing of fire-flies (1, 7, 9, 10), while Allard, in addition to comments on this subject, has described remarkable cases of synchronous chirping on the part of certain crickets (2). There may be no noticeable synchronism in the chirping at first, but if certain "nocturnal, atmospheric" conditions are right, the crickets gradually build up a synchronic rhythm, producing an effect like "waves of solemn music."

In the field of pure psychology, there appears an introspective study of visual rhythm by Ruckmich (14). He confirms the conclusion of previous investigators that visual rhythm is a possibility, finding even a series of equally spaced flashes all of the same duration, intensity and color sometimes to produce a definite grouping experience. For the most part, the study was carried on with series of flashes which objectively showed regular variations in color hue, but none in intensity or duration. In general, rhythmical perceptions "were the rule rather than the exception." The introspective reports indicate that the grouping effect "can be carried almost, if not entirely, in visual terms, *i. e.*, without the influence of such additional aids as kinaesthetic sensation." Many of the phenomena

which accompany other kinds of rhythm were noted. These include the over- and under-estimation of intervals and illusions of duration and intensity. These phenomena were variable, the most uniform being the illusory lengthening of intervals between groups.

In a bibliography of rhythm (15), Ruckmich supplies 115 titles. This supplements and brings to date his original list of 344 titles, and his first supplementary list of 66 titles.

Another study of visual rhythm, which seems only recently to have acquired publicity, though completed in 1910, is that by Weidensall (17). This study resembles the later one of Ruckmich in that it is largely introspective and contains a number of the same findings. Lights showing considerable movement were found to be much less favorable to a sense of rhythm than still lights. With still lights, there occurred abundant instances of both subjective and objective rhythm, "all very like those of auditory rhythm in complexity, in definiteness, and characteristics." In addition to the introspective observations, some experiments were made on the ability of the subjects to reproduce the temporal relations of the light series by movements of the hand, head, lips or foot.

Boring and Boring (5) deal with the accuracy of the estimates of the time of night by subjects just awakened from sleep, and with the conscious cues to these estimates so far as the subjects can tell them. In general, the errors tended to be greatest when the awakening occurred about the third hour of sleep. The most frequent cues, the designation of which all the observers found difficult, were those which depended upon the general bodily state, such as feelings of fatigue or restedness, sleepiness, "bladder-sensations," etc.

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CORRELATION

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The Evaluation of Tests.—The problem of measuring the diagnostic value of tests by correlation has come very clearly to the front through the contributions of Ruml. Following his paper of last year on the measurement of the efficiency of mental tests he has deduced what he terms the "rank-tangential coefficient" (33). He proposes using the new coefficient for measuring the value of tests for selecting any portion of a group in order of rank. As a corollary to this, the rank-tangential coefficient gives a measure for determining what portion of a group can best be selected by a given test. This measure may often be more important in practical situations than the correlation coefficient which is the basis of determining only the slant of the smoothed regression line. Ruml shows from the results of tests on three different groups of college freshmen that the tests may be decidedly more valuable for selecting, within the class, groups of similar mental ability than for predicting relative standing within these groups. For two freshmen classes the series of tests which showed a product-moment correlation of about .65 with teachers' estimates gave rank-tangential coefficients of over .90 for selecting the lowest 10 per cent. of the freshmen.

The rank-tangential coefficient is deduced from Pearson's bi-serial r, which Ruml suggests calling a tangential coefficient (T) instead of a correlation coefficient, since it is equal to r only under certain conditions, although it is equivalent in meaning and varies from $+1$ to -1. The rank-tangential coefficient, "t," is easily computed and expresses "the ratio of the mean value of X devia-

tions in rank associated with a Y array, to the mean deviation of that Y array." In using the rank-tangential coefficient, it should be remembered that units of rank are treated as equal and the measure of relationship is for resemblance in ranks rather than for resemblance in other measures of ability.

In another paper, Ruml (32) raises a second important objection to regarding the correlation coefficient as always the best indication of the diagnostic value of a test. He plots the relation between the coefficient of correlation and the standard error of prediction of x from y. The increase in the error of prediction is very rapid with the decrease in the size of the coefficient; so rapid, in fact, that when a correlation is as low as .50 the error of prediction is 7/8 of its maximum size. Instead of using r, Ruml, therefore, proposes using the error of estimate as a measure of the diagnostic value of a test.

Rosenow (30), for the first time in psychological work, calls attention to an important characteristic of the multiple correlation coefficient, which suggests a minumum value below which it may have little value even when it is large compared with its own error. He uses Yule's approximation formula to discover how large the coefficient might be owing to the fluctuations of sampling among wholly uncorrelated variables, on account of the fact that the errors do not neutralize each other but are cumulative. Thus, in his study of the multiple correlation between the class standing and 15 tests from 92 cases a multiple correlation coefficient of .40 might arise from variables which were not related at all. The actual coefficient found, .55, when all 15 tests were properly weighted, therefore had little value. On the other hand, with the five best tests a multiple coefficient of .52 is quite significant compared with the value .21 which might be obtained by chance.

The theory underlying Hardwick's method (14) for a new approximation to the best weighting in points to be given for each of the 20 tests in the Yerkes-Bridges-Hardwick Point Scale is hardly justified statistically. It is, however, perhaps better than the common practice of giving a person a summated score from a series of tests without weighting them at all. She assumes that "the tests would be correctly weighted if their scores were proportioned to their respective correlations with general intelligence." She then proceeds to find the average correlation for each test for three groups, 6-year-olds, 9-year-olds, and 12- and 13-year-olds between that test and the total point score for the individuals. The best weighting could only be obtained by partial correlation.

It is essential that allowance be made for the intercorrelations of the tests. Giving the same individual time after time credit in points for the same sort of tested ability tends to lessen the prediction value of the combined score. It decreases the value which the supplementary abilities would have in the total prediction. Rosenow (30) discusses this question at length in weighting the Kitson tests at Chicago University. Two features of the data which Hardwick presents are important, although they are not commented on by her. Five of the tests show a difference of .50 or more in the different age groups in the closeness of their correlation with the total score. Moreover, between the ranking of the tests on the basis of high correlation for the 6-year-olds and for the 12- and 13-year-old group there is a minus correlation. This suggests that a weighting for younger ages probably would not hold for older ages. High correlations with general intelligence often indicate a wider scatter of the test scores; but not theoretically, as she assumes, a nearer approach to a normal distribution of scores.

Method.—Rugg's chapter on correlation (31) presents in 75 pages for the non-mathematical reader the best simple treatment of the measurement of relationship. Schoolmen will especially appreciate his success in explaining the reasons for the principal devices and their significance without expressing the explanation in technical language. The methods of computing the various coefficients are also presented simply and fully. Unfortunately, space forbade his including partial correlation which illuminates the whole subject of analysis of causes. It will probably be the most important feature of the work in correlation during the next decade. An admirable illustration is given of the non-linear relation of cost-per-student-instructed and number of pupils instructed by one teacher. Diagram 43 would be simpler and more in accord with Galton's presentation in his *Natural Inheritance* if the line which measures the proportion of perfect correlation extended from the diagonal of perfect correlation across the regression line perpendicular to the mean X axis.

Otis (26) has shown how to find the relative weighting of two variables for predicting a third without calculating any of the partial correlation coefficients. The method saves about half the calculations of the usual partial regression equation and is useful when the errors of the prediction are not required. He also provides the corresponding formula for more than three variables, which reduces the number of partial coefficients to be calculated. Rosenow (30)

contributes a scheme for the mechanical technique of calculating partial coefficients which may reduce the labor of calculation as much as half, when only the relation to one dependent variable is required as is common in psychological work.

The normal probability table does not apply accurately to the probable errors of coefficients of correlation calculated from small samples. An elaborate co-operative study (**35**) now makes available further tables for estimating the skewed distribution surfaces of the correlations for small samples. These surfaces are all forms from a rectangle to J and U forms, but in general it may be said that the distributions of the correlations in small samples tend to have modes above the true correlations and means below the true correlations. For example, with a true correlation of .50 in the population sampled, the modal correlation expected, when calculated from samples of 10 cases, would be .63 and the expected mean of the correlations in such samples, .48. Pearson (**27**) provides the tables for determining the error of the correlation coefficient calculated by his biserial η, when one variable is given in alternative catagories and the other by multiple catagories. Lee (**18**) completes Everitt's work by providing the supplementary tables for calculating correlations above plus or minus .80 by the tetrachoic method in certain cases not previously covered. We may expect more and more use of this method with social material in which the data can often be divided only into two groups.

Analysis of Abilities.—The use of correlation for unraveling the factors involved in various abilities continues to be fruitful. In this connection, the study of special abilities is suggestive. Seashore and Mount (**34**) give an elaborate analysis of the relations of tested musical talent to musical training, environment, the enjoyment of music, and musical accomplishment. The low correlations indicate that training is commonly given with little regard to talent. Stevenson (**36**) finds that intercorrelations of discrimination of sounds, lines and brightnesses, when accurately measured, bring out close relationships (.90 plus) in sense discrimination. With pressure, accurate tests were not possible and the correlation was less. In a penetrating study Downey (**9**) shows the possibility of the degree of unidextrality being indicative of specialized capacity which may be of value in some forms of spatial orientation. It is related to mirror-reading and, perhaps, to visualization. Gordon (**11**) does not find that unidextrality goes with either strength of grip or maturity. The correlations between abilities in the four

fundamental operations in arithmetic are from .46 to .75. McQueen (21) by a very complete statistical treatment, including partial correlation to eliminate the effect of certain factors, finds that there is no evidence of a general power of distribution of the attention. Bickersteth (2) also gives negative evidence for common factors. The small correlations between tests for divided and sustained attention give no support for the idea of one capacity of attention. Rosenow (30) illustrates with Kitson's test data on Chicago University students what may be done by correlation analysis of mental functions. Bennet (1) found auditory and visual presentation with disconnected materials had more in common than with connected materials, and that ability in mediate retention has more in common with different materials than ability for immediate recall. Gordon (12) shows an independence of memory for nonsense syllables and rapid learning of music. Dearborn and Brewer (7) give the relations of a class experiment in learning a code to tests of memory. Buckingham (5) finds correlations of about .4 between tests for ability to think about and ability to remember facts in history.

In Business Psychology.—Hollingworth and Poffenberger (15) give the correlations between tests and success in 11 occupations; Burt (6) gives them for the Münsterberg vocational tests; Rogers (29) for stenographers and typewriters. The latter found that the empirical selection of tests would give "a far more reliable criterion for vocational guidance in the field of stenography than has ever been attained by any other method." Moody (24) gives the correlation between salaries of teachers and their academic grades. Marks in the theory and practice of teaching are no better than average scholarship. Inspection of the tables shows closer relations with low marks and low salaries. The highest coefficient found with salaries was .52. A method of estimating various personal traits for the use of the employment bureau at the Carnegie Institute of Technology is evaluated by Miner (22). Estimates of leadership are least indicated by grades. Gould (13) shows that a test for memory of names and faces agrees .75 with the empirical test of this ability among 10 psychologists when trying to remember a group of 17 students after brief introductions.

Mental Development.—Correlation was used extensively by Bickersteth (2) in his study of the variations of tested abilities with maturity. The same 12 tests were given to children of different ages. He thinks that the tests reached capacity because they

showed small correlations with life-age, when children were in the same grades and were from 9 to 11 in age. There is small relation between mental and motor ability and it decreases with age, while the interrelations of the tests of higher mental traits increase with age. In an important comparison between normal and feeble-minded children of the same mental ages, Woodrow (39) concludes that there is an absence of correlation between capacity to learn and capacity to grow mentally. The correlations for absolute and for relative gain with practice in a form sorting test for the normal and for the feeble-minded group were negative with initial ability in the test. Those for percentage of improvement were practically three times their P. E.'s. This is only apparently contrary to the usual results in which those who are best in a test improve most with subsequent practice since here differences in mental age were almost eliminated. Following Woodrow's argument we might suppose that greater mental ability, even greater mental maturity; but not greater capacity for mental growth (capacity to increase mental age) may go with rapid learning. "The connection between language differences and intelligence differences becomes more intimate with increasing years," so Brigham found (4). Terman *et al.* (38) found that the correlation between I Q's obtained with the Stanford Scale and teacher's estimates of intelligence increased from .48 to .71 when the effects of extraneous factors upon the estimates were eliminated. Doll (8) shows that the results with his two brief Binet scales correlate over .90 with the complete mental age ratings for either normal or feeble-minded children. The ratio of actual to expected school grade, Pedagogical Quotient, correlates .82 with the I Q's of school children. Race (28) gives the correlations of I Q's with various tests. The opposites test is closest related and Courtis' Arithmetic test only .09.

School Records.—Besides the studies of Ruml (32) and Rosenow (30), there are numerous correlations with school work. The closest relation for a series of tests and school grades was at the Whitewater Normal where James (16) found that the average record from his series of five tests correlated .55 to .63 with different school subjects. Bright students not studying and dull students studying hard reduce the correlations. Gordon (11) found a correlation of .77 between a mechanical syllogism test and college grades. King and M'Crory (17) give correlations for 276 women and 268 men in the freshman class of the College of Liberal Arts at Iowa University. The intercorrelations of the tests are also given, but

the authors do not combine them in a multiple coefficient. The differences between the correlations with university grades for men and for women, especially with the opposites test, .84 and .45 respectively, suggest that the male group is more varied in ability. It is important to remember that the size of the coefficient increases decidedly with increase in the extent of scatter of the group. This may account also in part for the low correlations of tests with class averages found by Sunne (37) and also for those by Garrison (10) who used scores in the Point Scale. The tests often do not sufficiently discriminate those of best ability. Minnick (23) finds that four tests for different types of ability in geometry show widely different correlations in different schools. How much this result is influenced by differences in the native variability of pupils in the different geometry classes and how much is due to difference in methods of teaching is an important educational problem. Coefficients of .55 or over were found for each test in some school. Myers (25) found that in delayed recall students remembered best the names of the military men most frequently mentioned in histories, but that this was not true for names of prominent civilians. Breed (3) found that Starch's method of testing the comprehension of reading does not measure the same factors as Thorndike's. McCall and Ruger (20) demonstrate that a study of the correlation of psychological and educational measurements was closely duplicated by a similar study a year later. Lincoln (19) finds that high school marks correlate better with college marks than do entrance examinations.

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SPECIAL REVIEWS

The Self and Nature. DeWitt H. Parker. Cambridge: Harvard University, 1917. Pp. vi + 316.

The writer of this notice would like to deduce from the fact that DeWitt H. Parker's book on *The Self and Nature* was sent for review to the Psychological Bulletin the hopeful conclusion that publishers at any rate recognize that psychology has to do with selves. She must however admit that, in this case, the title has proved misleading. The truth is that self and nature, mind and body, may be either scientifically treated—accepted without challenge of their ultimate reality for analysis at the hands of the scientists—or may be treated from the metaphysician's standpoint. Professor Parker's book is the embodiment of a philosophical system; it sets forth an independent and vigorous idealism with Berkeley's and with Bergson's, though identical with neither. Mr. Parker "finds it reasonable to interpret the processes of the external world after the analogy of the inner world" (p. 143.) He says truly (p. VI.) that: "The source of all our knowledge of reality is given experience—without a careful analysis of this there can be no sound metaphysics." It follows, of course, that the philosophy of self or mind is rooted in psychology; and there is accordingly no cause for surprise in the fact that more than one chapter of th∂ book is fruitful in suggestion to psychologists. This is notably true of Chapter II. in which Mr. Parker asserts as facts of experience both the identity and the changing nature of the self. "Permanenceand change," he says, (p. 50[1]) "adventurous seeking for the new and a tragic holding on to the old or effort to escape the old; self-making and self-mending —such is the life of the mind. Throughout there is the thread of identity; the old man remains in some respects the same as the child. Yet the amount of this identity varies on different occasions. It is great when a man puts all his emotional energy into some task which requires the use of his whole past experience, the total resources of his memory and learning; then, as we say, he is most himself; it is little when in a light moment of gaiety, he forgets himself, feeding on new impressions."

Professor Parker sharply and successfully contrasts the "idea" or "concept" or "thought" of identity with the immediate "feeling"

of it. "The abstract concept of identity," he says (p. 41[3]), "like all concepts, is the reflex or representative in the mind of something real in that which the mind knows and reflects upon. The application of a concept to anything is the assertion that there exists in the thing a reality corresponding to the concept, known by the concept. . . . Personal identity, is however (p. 51[2]), no more identical with self identification than blue is with the concept of blue. When we waken in the morning we feel ourselves to be the same without any over assimilation of the new experience to the idea of ourselves; the idea may not arise at all. There are times when the idea of self is in abeyance, as when we work quietly; yet there is a sense of familiarity which pervades all experience and is the abiding identity within it." A second point which is stressed is the fact that the feeling of personal identity persists during great disturbances of cœnæsthesia and of memory. "Personal identity," Parker says, "can be more or less. . . . From birth to death there is a continual acquisition of new experiences; a partial preservation of these through the residua of memory; a re-emergence of old activities; the loss again of these; the irreparable loss of some" (p. 50[1]). We usually," he adds, "call a man another man when he fails to recognize himself—when he applies to his experience a different concept of self from the one which we have been accustomed to (p. 50[2]). . . . Yet identity may exist here as elsewhere. . . . Experience may in some measure be familiar still."

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Applied Psychology. H. L. HOLLINGWORTH & A. T. POFFENBERGER. New York: Appleton, 1917. Pp. 337.

This book is the first attempt in English to cover in one volume the entire field of applied psychology. Such an attempt, especially in a volume of medium size, must needs be cursory, but the authors are content "if it assists in systematizing" the field,—which it certainly does. According to the preface the work is intended alike for teacher, student and the general reader. It might very well serve as a nucleus on which to build a course in applied psychology and it is sufficiently non-technical to be understood by the business or professional man who is interested in the subject.

The first chapter touches upon the modern behavioristic trend, pointing out that in practical situations it is behavior (in the broad sense) which is of importance. Exception is taken to Münsterberg's

separation of applied psychology from psychotechnics but there is agreement with his other proposition that applied psychology should deal with means and not ends. Then follow a few pages on the history of applied psychology and its relation to efficiency. Finally the fundamental fact is emphasized that applied psychology must "rest upon a knowledge of the laws of individual behavior."

After this introductory chapter the first half of the book is devoted to factors which affect the personality and efficiency of the individual. The latter half considers specific human purposes,—business, law, medecine, etc.

Heredity is discussed from three standpoints,—species, race and family. The first of these includes a catalogue of some reflexes and instincts and other characteristics such as sensation, attention and memory. Under the second there is mention of Woodworth's form-board studies of different races and a study of school marks of negro vs. white children. It is doubtful whether this chapter (II) adds much to the book aside from making it appear more systematic. However the topical arrangement here, as elsewhere, is very commendable. Under family inheritance mention is made of the statistical studies of Galton, Thorndike's study of sibs and twins, Goddard's *Kallikak Family* and others. The eugenic implications of the facts are emphasized and the present legal status of the control of marriage and procreation in defective cases is described.

In the chapter on "Efficiency and Learning" the salient facts concerning the acquisition of skill are outlined. One point not always mentioned in such discussions is brought out, viz., the incentive of competing with ones own record. Then follows a good summary of economy of memory, the unimportance of imagery for learning and typical results showing lack of transfer of training and the reduction of variability by practice. The chapter is one of the best in the book.

We now turn to differences due to sex and age. The overlapping of the two sexes in mental traits, measured and estimated, is clearly shown by tables and examples and data is presented controverting the familiar claim of greater variability in the male sex. Curves are given for results of mental and physical tests at different ages and the importance of mental vs. chronological age is emphasized.

Two chapters are devoted to "Environmental Conditions." The results of the New York Ventilation Commission are drawn upon to show that the paramount questions in ventilation as affecting mental efficiency are temperature and humidity rather than

oxygen and carbon dioxide. Climatic and weather influences are reduced to these same two factors. Diurnal rhythms in mental and motor processes are discussed, showing maximum mental efficiency in the forenoon and maximum motor in the afternoon. Ferree's work on illumination is summarized,—the desirability of uniform illumination, unglazed paper and opaque eyeshades lined with white, etc., because of the peripheral sensitivity of the retina to glare and the impulses to turn or accommodate the eyes. The effect of distractions in sometimes using up additional energy even if the distraction is overcome is noted. The effect of monotony is shown to be a question of incentive and interest rather than environment.

Chapter VIII discusses work, fatigue, rest and sleep,—the difficulty of finding any adequate measure of fatigue; the importance of determining the proper rest periods; and the difference in the amount of sleep required by different individuals.

The next chapter deals with drugs and stimulants. This includes Bush's study of decrease in mental efficiency after tobacco smoking, with the greatest effect in imagery, perception and association; Dodge and Benedict's finding of a reduction in reflex and sensory processes after alcohol; the effects of alcohol on learning in rats; the correlation of alcoholism with feeblemindedness; Hollingworth's study of caffein and Poffenberger's of strychnine.

The remainder of the book is devoted to the application of psychology to special fields. This may be done in three ways: (1) applying the psychological attitude,—analysis,—an attitude not so characteristic of the other sciences; (2) applying psychological knowledge,—the findings of modern experimental psychology; (3) applying psychological technique,—the methods of the psychological laboratory.

"Psychology and the Executive" deals first with the selection of employees by mental tests and lists tests used by various investigators in a dozen vocations and the correlation coefficients of such tests with vocational ability. There is no mention of the theory of partial correlations which will probably afford the most striking progress in this field in future. Then there is mention of functionalizing in industry, measurement of performance by psychological technique, absence of any instinct for workmanship in the practical situation, standardizing work to fit the habits of the worker, the use of published records of performance and a workman's competition with his own record, environmental factors

already alluded to and dynamogenic factors such as rhythm. Much of the chapter is rather general. Some of the points might well be elaborated more specifically.

"Psychology in the Workshop" includes the undesirability of shifting the mental set in a mixed series of operations (for example, dishwashing); the distribution of work from the standpoint of fatigue (pig iron handlers); routing the path of movement; and motion study such as Gilbreth's .

"Psychology and the Market" takes up the question of trademark infringement as studied in recognition experiments; a general outline of the possibilities in the psychology of advertising (but only an outline); and a few pages on salesmanship.

Under "Psychology and the Law" we have as methods of accumulating evidence the association reaction experiment and expressive methods (breathing) to detect falsehood. In evaluating testimony comes the suggestive effect of variously worded questions. In connection with determining of responsibility are the facts of prevalence of mental defect among criminals. Finally an experiment is described in which individuals ranked the deterrent effect of a series of sentences varying from life imprisonment with almost absolute certainty of escape to ten days imprisonment with almost absolute certainty of punishment. There seem to be some individuals for whom the certainty and others for whom the penalty is the deterrent factor.

In "Psychology and the Social Worker" the prevalence of mental defect is shown in unemployment and delinquency and the normal distribution curve is mentioned.

Medicine may profit from psychological tests on patients to determine deviation from the normal or to check the efficacy of some treatment. Researches on the effect of drugs are of value to medecine. The importance of control doses and control squads in such experiments is duly emphasized. Psychoanalysis is alluded to with a final injunction that "the therapeutic success of a technique in no way constitutes a proof of such speculations as the practitioner may incidentally indulge in." The negative findings of Mrs. Hollingworth as to the mental effects of periodicity in women are noted. The advantages of the psychological clinic are pointed out. Finally it is suggested that training in experimental psychology would be valuable for medical students.

In relation to education we have the psychological attitude of analysis, for example, breaking up a given learning process into its

elements. The content of psychology is applied in all the laws of learning, memory, attention etc. and also in the differentiation of normal from abnormal. The psychological technique is applied in actual school-room experiments upon distribution of practice and the like and in the development of scales for special functions.

The final chapter deals with the future of applied psychology. The present means by which practical problems are being approached are far from satisfactory. Professional jealousy between physician and psychologist in the clinic, the acquiring of a smattering of psychology by the business man or the acquiring of a business knowledge by the psychologist while pursuing academic work are all undesirable. The immediate solution will be the placing of psychological experts in the factory, school, court, etc., and later will come the need for the engineering type of psychotechnic expert, —the consulting psychologist.

It is unfortunate that books of this sort have to be written with a view to the public as well as the psychologist. In writing for the layman considerable space must be devoted to matters that are almost trivial to the psychologist and in some instances generalities must be used to conceal the scarcity of psychological knowledge on a special topic. The student would gladly face the facts and would appreciate a fuller exposition of the topics which have been more thoroughly worked. One cannot help imagining a similar book (perhaps in two volumes) which takes for granted the fundamentals of psychology, presents specifically our scanty knowledge on certain topics without attempting to magnify that knowledge, treats other topics as systematically as in the present case but in considerably more detail and includes references to the principal studies and monographs utilized in the discussion.

The arrangement of the book is excellent and it would form a systematic outline for courses in the subject. It will undoubtedly be used as the basis of the majority of such courses for some time to come. The topical treatment in parts that are briefly summarized is very commendable. Considerable data is included that had been published since Münsterberg's *Psychotechnik* appeared in 1914.

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REPORT

COURSES IN PSYCHOLOGY FOR THE STUDENTS' ARMY TRAINING CORPS

Late in August, Major Yerkes, Chairman of the Committee on Psychology of the National Research Council, received information from the chairman of the Section on Relations with Educational Institutions that Psychology was to be listed as an allied subject by the Committee of the War Department on Education and Special Training. This information carried with it the suggestion that a suitable course in Psychology be prepared with especial reference to its military bearings.

After conference with members of the Committee on Education, members of the Psychology Committee of the Research Council and representatives of the American Psychological Association, a sub-committee of the Research Council was appointed; consisting of Messrs. Dodge, Baird, Strong, Terman, Thorndike and Whipple.

This Committee had the task of meeting the general policy of the Committee on Education and Special Training and of organizing the available material on the psychology of war into suitable courses for prospective officers.

Three courses are suggested. I. The Study of Human Action. II. Educational Psychology. III. The Psychology of Reasoning. It is expected that each course will occupy a quarter of twelve weeks, three recitations and six hours of study a week. But any other division of the nine hours a week may be made at the discretion of the instructor.

A monograph text book for course I is in preparation under the collaboration of Messrs. Dodge, Thorndike, Terman, Strong, Baird, Hall, Lindley and Whipple. Since its preparation and publication is sure to be delayed several weeks, all practicable data will be supplied by the Committee through the courtesy of the PSYCHOLOGICAL BULLETIN.

The following suggestions and recommendations with respect to the content of the three courses are submitted.

Course I. The Study of Human Action

In the present war, psychology has been adapted to meet military needs in many new ways. In particular, new tasks which confronted the Army and Navy have been analyzed and means have been elaborated for finding properly qualified personnel. Methods have been developed for testing and classifying the drafted men to meet the intellectual, technical and administrative needs of the rapidly expanding Army, and to prevent those who were unfit from having improper responsibilities put upon them. Systematic rating scales have taken the place of casual opinions of the fitness of men for the duties of officers.

In the so-called "psychological offensive" of various sorts, in propaganda for morale, in camouflage and signalling, in intelligence service and military operations, psychological principles have become an increasingly obvious part of war machinery. Even the fundamental military tasks of instruction and discipline are based on well-known psychological laws.

An officer must understand not only the materials that are essential to his line of service, but he must also be taught to understand the human factors with which he has to deal. For example, it is not enough that an artillery officer should understand the operation of his gun, range finding, spotting, sight setting, the effect of atmospheric conditions, ballistics, etc.; he must also know how to organize, control and develop a competent gun crew. Unless he can do this, all the rest is useless. In no military task is the human factor absent. With the complexity of modern warfare, it is increasingly important. Failure to understand the human factor in a military situation may have disastrous consequences.

Doubtless young officers will eventually acquire more or less facility in handling men, but in the present exigency all preparation must be condensed to essentials and systematized to save time and to eliminate waste. We cannot wait for prospective officers to get the necessary information by accident or by the costly methods of trial and error.

In view of all this:

It is believed that the psychological principles which underlie established military practice as well as the principles on which the recent mental examinations and tests are based, should be brought together in a course in the study of human action for the S. A. T. C.

and made available for all prospective officers including those who will spend only one quarter in college. That is the idea of Course I.

It is consequently recommended that the elementary course in "the study of Human Action" be given in institutions which have the necessary equipment, omitting as far as possible all questions of a purely speculative or theoretical nature and concentrating on the relevant questions of applied psychology.

While it is desired to leave each instructor the greatest freedom for personal initiative, it is recommended that reading assignments, formal reports, and recitation discussions be used rather than lectures; and that wherever practicable concrete military problems should be used for illustration.

It is further recommended that in contrast to the common plan of elementary courses in psychology, the emotions and the will be emphasized instead of the intellective processes, and that the course be applied psychology rather than systematic.

The subjects which are regarded as essential to such an elementary course in human action may be outlined under six sections.

I. The general characteristics of personal action and the conditions of effective reaction to new situations.

Difference between the reactions of a thing and the reaction of a person. Reflexes and their characteristics. Habits, their origin and importance. Voluntary action. Reaction time. The personal equation. Initiative. Practical intelligence. Estimating the situation. The mission or goal of action. Selection and choice.

II. Individual differences and their military exploitation.

The varieties, extent, measurement, and causes of individual differences. The relative influence of inheritance and experience. (Development battalions.) Intelligence tests. The classification of personnel in the Army. Trade tests. Rating scale for officers.

III. The learning process. General characteristics of habit formation. Plasticity. Fluctuation. Improvement and its limits. Fatigue.

Kinds of learning; trial and error, (laws of repetition and effect) (drill), association learning, imitation, reorganization. Laws of fatigue, saturation ("fed-up" conditions). Forgetting. Warming-up process. Individual differences in learning. Selection of men for schools. Rate of learning.

IV. Motivation and Morale.

Ideals and incentices. Interests, motives. Positive and negative incentives. Origin of ideals. Relative force of different incentives. Methods of developing and controlling ideals. Discipline. Motor outlets. Direct and indirect teaching. The military value of morale. What factors modify morale in the Army, people, workmen, enemy. Specific times of danger or fluid morale. Means used to develop morale in camp and field and among the different classes of the people. Esprit de Corps.

V. Principles of leadership.

Physical and mental essentials, value of knowledge, confidence, enthusiasm, reliability, resourcefulness. Crowd psychology. Principles of discipline. Methods of influencing others, command, suggestion, argument, sympathy, sternness, and softness. Traditions of conduct. Indoctrination. Prestige. Special problems of the draft.

VI. The sources and critical estimate of information. (The psychology of observation and report.)

Individual differences in sensory capacity. Utilization of persons with exceptional acuity. Individual differences in twilight vision, etc. Commoner defects and limitations. Perceptual errors. Commoner illusions that have military significance. Chief principles in camouflaging designed to prevent acquisition of information. Observation; systematic perceiving; knowing what to look for; interpreting the "senses." Training observers; its nature and possibilities. Memory (retaining and recalling what has been observed). Commoner limitations and defects of memory and recall, like omission, insertion, substitution, transposition. Verbal formulation (stating what is recalled of what was observed). Forms of report; the narrative and the questionary. Art of questioning; influence of suggestive questions and the like. Special problem of using quantitative terms in reports, as meters, inches, minutes, degrees, number. Effect of excitement and emotional stress generally on report. Intentional misrepresentation; lying. Military intelligence; methods, organization and training.

Considerable parts of the above course relate to material that is not readily accessible in any of the common text books. To supply this material is the purpose of the proposed series of mono-

graphs and source books. But since these are bound to be delayed, instructors may properly take up first those subjects with which they are familiar. Series of suggested questions for student reports will be issued at the earliest opportunity in the PSYCHOLOGICAL BULLETIN.

Aside from the familiar text books and monograph literature on systematic, physiological, educational and business psychology, attention of the instructor is called to relevant literature on crowd psychology, suggestion, business management and efficiency. Valuable reference may be made to historical, biographical and eye witness accounts of the war, and to war psychologies. Especially important from the standpoint of the present course are the psychological contributions of Army and Navy officers. It is impossible for instructors to get too thoroughly indoctrinated with the military point of view. For this purpose the following monographs will be found of especial value.

1. REAR-ADMIRAL AUSTIN M. KNIGHT, U. S. N. *The Estimate of the Situation.* U. S. Naval Institute, 1915 (April).

2. SURGEON J. F. LEYS, U. S. N. Mental and Moral Training for War. *U. S. Naval Medical Bulletin*, 1915, p. 165 (April).

3. MAJOR LEROY ELTINGE, U. S. A. *Psychology of War.* Fort Leavenworth: Army Service Schools Press, 1917.

4. CAPTAIN R. R. BELKNAP, U. S. N. Military Character. *U. S. Naval Institute Proceedings*, 1918, 44, No. 179, p. 1 (January).

5. VICE-ADMIRAL WILLIAM S. SIMMS, U. S. N. Military Character. *Infantry Journal*, 1918, 14, No. 8, p. 553 (February).

6. COLONEL APPLIN, British General Staff. *Lectures on Discipline and Training.* Washington: Army War College, 1918.

7. MAJOR C. A. BACH, U. S. A. Leadership. *U. S. Naval Institute Proceedings*, 1918, 44, No. 186, p. 1819 (August).

Material on intelligence tests in the Army, the classification of personnel, trade tests and the rating scale for officers will have the earliest possible publication. It may also be obtained by application to the personnel officers who are assigned to each S. A. T. C.

Following the general plan of the Committee on Education for providing courses for those who will be able to stay in college more than three months, the following continuation courses are suggested:

Course II. Educational Psychology

This course when given should be a systematic course in Educational Psychology but emphasis should be laid on the special military problems such as technical military training, the problems of personnel, mental testing and examination, the education of retarded adults and re-education of the wounded.

Course III. The Psychology of Reasoning

This course should include perception, the concept, memory, imagination and reasoning. Under reasoning emphasis should be laid on the processes of induction and the interpretation of facts. The following topics are recommended: psychology of meaning; natural and conventional symbols. Systems of experience and their implications. The mind of an expert. Difficulty of distinguishing between observation and interpreting. Correct interpretation as the goal of thinking. Distinction between cock-sureness and critical certainty. The mind of an amateur. The collection of data. When the data are adequate. What facts are relevant. The explanation and implication of a fact. Interpretation by analogy; its popular appeal and its dangers. The analysis of data. Reference to systems of cause and effect. Systematizing fragments of information. Circumstantial evidence. The making and testing of hypotheses. Values and dangers of hypotheses. Natural law and practical certainty. The estimation of probability. Common sources of error in inference. Tradition and habit. Emotional bias and prejudice. Suggestibility. Fixed ideas and delusions. The reasoning of crowds. The fallacies.

Questions and Problems for Study, Report and Class Room Discussion

These cover Section I of the elementary course in the study of human action (see p. 130).

1. The effect of mind on reaction: In what particulars would the command to take a trench affect a soldier differently from the way it would affect a lifeless thing like a log of wood? How can the presence of mind be proved? How far can one know what is in the mind of another, and by what methods? How do differences in age, race and class affect this knowledge? What are the consequent advantages of training officers first as privates?

2. Reflexes and Instincts: Describe the mechanism by which man shrinks from pain. Describe six human reflexes. How do reflexes differ from reactions to command, in mechanism, in reaction time, in voluntary control? What are instincts? In what ways do they affect adult life? Name and describe the operation of six human instincts that bear especially on the efficiency of a soldier.

3. Habits: What is the nature of habit? How much of a day's work is habit? State the personal and social advantages of habit. What is the value of drill? What are the disadvantages of habit? State the best method of eliminating undesirable habits.

4. The personal equation: What constitutes a personal equation? Do they actually exist? Why? What factors in the personal equation would you judge to be essential to make a good officer, a good scout, a good chum?

5. Coördination and Initiative: What is coördination? Describe the coördinations in writing, in shooting a flying duck. What is the nervous mechanism of coördination? What is the mechanism of coördination in an army? What is initiative? What is its military value and its danger? How can coördination and initiative be most effectively combined?

6. Voluntary action: What mental factors are found in voluntary action that are not found in reflexes and habits? If you were in a motor boat two miles from land and the boat started to leak what should be done? How would reaction to the situation be modified by the object of the trip, extent of the damage, and means of repair? What would constitute an adequate estimate of the situation? How long should deliberation last? In very important cases how can one be sure that all relevant factors are duly considered? When quickness of decision is necessary how can one prepare his reaction beforehand?

7. What advantages has an expert motor repair man over an amateur? What are your resources? What ought you to get from a military education?

The Purpose of the Questions and Problems

Following the general policies of the Sub-committee on Psychology, these questions like the rest of the course must be regarded by the responsible instructor merely as suggestions. They are not in any sense requirements but are printed for the convenience of those who may desire a more detailed indication of the Committee's idea of the content and method of the elementary course.

The questions are primarily planned to guide the reading of the student, by giving him specific matters to look for and to think about. They are consequently partly systematic questions to emphasize principles and partly problem questions for the application of principles.

No specific text references will be given wherever the systematic questions may be answered by the students by reference to the standard texts which should be available to them. The instructor will naturally want all his students to read some classic chapter like that of James on habit; but otherwise the discovery of the appropriate matters may well be regarded as part of the education of the student. The problem questions are not intended to be answered from texts.

[*Editorial Note:* The delay in the appearance of the BULLETIN has permitted the insertion of the foregoing report, which is much postdated as compared with the present number of the BULLETIN. The importance of the report has made this apparent anomaly of little consequence as compared with the value of immediate publication. S. I. F.]